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for

SIXTH GRADE TEACHERS

U. S. DEPARTMENT OF AGRICULTURE
✓ FOREST SERVICE

WASHINGTON, D. C.

September 1949



Natural resources are like a bank account. For over three centuries one American generation has been passing this account on to the next generation. With each generation the balance has become smaller. Everyone knows that we cannot draw on the principal of a bank account indefinitely.

With nonrenewable resources like copper and oil we can take out but we cannot put in. Conservation for copper and oil means smaller withdrawals. But with renewable resources like forests, we can take out and we CAN ALSO PUT IN! Forest conservation is a matter of wise use.

Today's school children will soon be owners and custodians of forests. How wisely they use them will depend, in a large measure, on what they learn about conservation.

The U. S. Forest Service hopes that the mathematics problems in this pamphlet will be practical aids to teachers who are integrating conservation in mathematics, science, social studies, and perhaps other subjects as well. They may also be valuable to textbook authors and publishers who are including more and more conservation in their publications.

United States Department of Agriculture
Forest Service
Washington



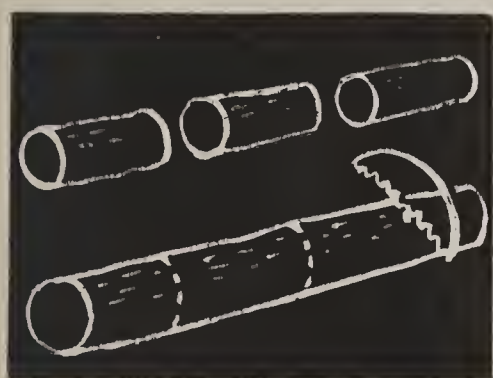
Problem No. 1

After a log is sawed into boards at a sawmill, the boards must be dried. They have rough surfaces. Before they are shipped to the lumber yard in the city, they must be smoothed off in a machine called a "planer." A rough board is $1\frac{1}{8}$ inches thick before it goes through a planer. When it comes out it is smooth and only $2\frac{5}{32}$ inch thick. How much of the wood was shaved off in planing?

Solution: $1\frac{1}{32}$ of an inch.



Lumber should be dry before planing. If it is green the boards will come out looking fuzzy instead of bright, clean, and smooth. Green lumber warps and shrinks, too.



Problem No. 2

It takes six minutes to saw a log into three pieces for fireplace wood. How long does it take to saw the same log into four pieces, if each cut takes the same amount of time?

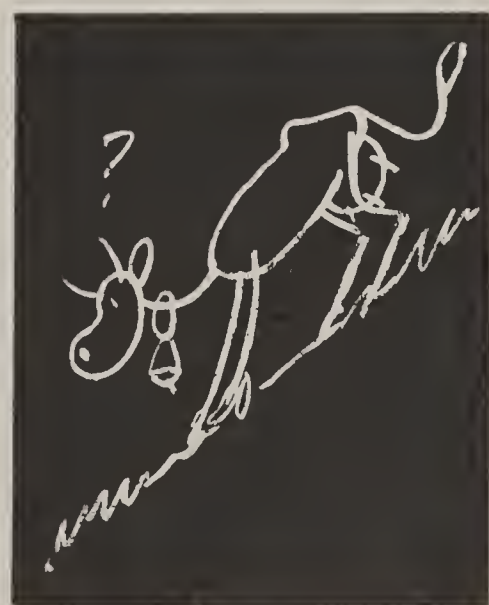
Solution: To saw a log into 3 pieces requires two cuts. To saw the same log into 4 pieces requires three cuts. Therefore, it takes 9 minutes to saw the log into 4 pieces.

How a logger cuts a tree into logs is very important. He can make money or lose money, depending upon where he cuts. A good logger can cut fairly straight logs from a crooked tree if he knows where the cuts should be made. There is less waste in straight logs than in crooked logs.

Problem No. 3

On Mr. Arthur's farm, one pasture was so steep and closely grazed that the soil washed away with every rain, and settled on some good level fields below. The county agent advised Mr. Arthur to keep cows out of it and to plant trees there to hold the soil in place. Mr. Arthur planted 6,000 trees. (a) If 1,000 trees were planted on each acre, how many acres are there in the field? (b) One-third of the trees are pine. There are $\frac{3}{4}$ as many spruce as pine, and the remainder are tamarack. How many pine trees are there? How many spruce? How many tamaracks?

*Solution: (a) 6 acres.
(b) 2,000 pine trees, 1,200 spruce trees,
2,800 tamaracks.*



Trees help hold the soil in place and are a profitable crop for land which is too poor and steep for good pasture.

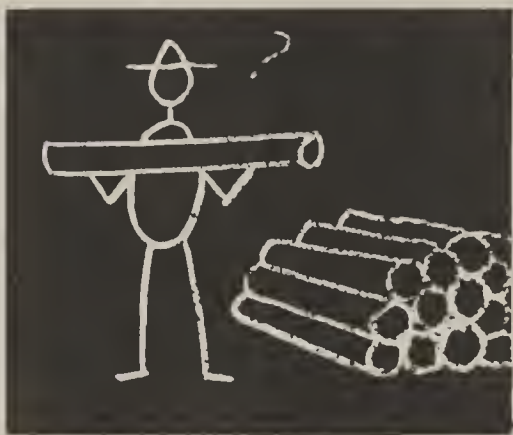
Problem No. 4

Lumber is cut from logs in sawmills. This makes jobs for men. Foresters cut only the trees which are ready for harvest. Healthy young trees are left in the woods to grow and some big trees are left to seed in the cut-over areas. If no good trees are left to help make another crop, the mills will eventually run out of logs and shut down. In 1943, a whole southern town was sold to a wrecking company after 100,000 acres of virgin longleaf pine had been clear cut. It took 25 years to do this. How many acres of timber were stripped each year?

Solution: 4,000 acres.



In the South there are 3 acres of timberland for every 2 acres of agricultural land.



Problem No. 5

Jerŕy walked beyond a log cutter in the woods. He saw another man cutting poles with which to build a fence. If one pole weighed 40 pounds, how many poles were there in a load weighing 880 pounds?

Solution: 22 poles.

To speed up the growth of trees in crowded woods, foresters "thin" the timber. This means that poor and crowded trees are cut out to make room for healthy, fast-growing trees which the forester has picked to be his "crop" trees. These thinnings are often sold as pulpwood, posts, mine props, etc.

Problem No. 6

The sixth-grade science club went to the forest on a stump hunt. They were studying how a tree grows. They found a freshly cut stump on which they could count the annual growth rings. The stump was $1\frac{1}{2}$ feet in diameter and had 32 growth rings. How many inches in diameter had the tree grown per year? (For each year of growth a tree puts on one annual ring.)

Solution: $\frac{1}{2}$ inch per year.

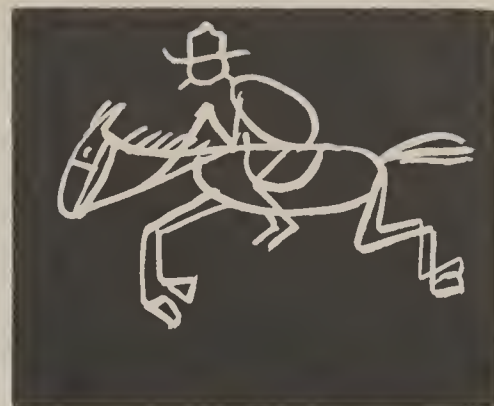


Petrified wood is wood turned to stone. The structure is so well preserved that the growth rings of the original tree are clearly visible. Petrified wood that is 40,000,000 years old is found in various parts of the United States, the most famous being the Petrified Forest National Monument of Arizona.

Problem No. 7

Diane's father is a forest ranger who just reached the Wallowa Creek forest fire. He traveled $\frac{1}{4}$ hour by car to Enterprise; then he went by plane for $\frac{1}{2}$ hour to a landing field in the forest; and from there he rode horseback for 40 minutes before he reached the fire. How long did it take him to get to the fire after it was reported to him?

Solution: 1 hour and 25 minutes.



Fire fighters must get to a forest fire quickly. If they do not, the fire may get so big that a lot of valuable forest will be destroyed.



Problem No. 8

Robert went with his father and mother to the Winona State Forest to attend the Grange picnic. While they were eating, his mother wondered how many people were there. Robert, who had finished eating, counted 53 picnic tables, all made of heavy planks and stained a rich brown color. If 5 people were sitting at each table, how many attended the picnic?

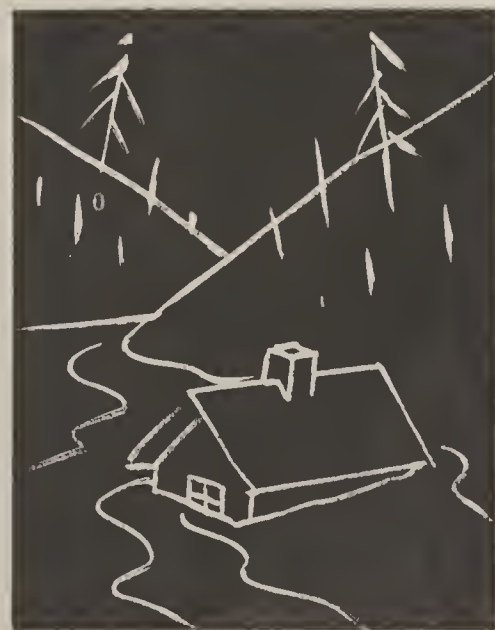
Solution: 265 people.

Millions of families go on picnics in the woods every year. That is another way in which many of us use the forests.

Problem No. 9

A family built a cabin in a canyon in the hills near Los Angeles. It cost \$4,000. In 1934 a great forest fire burned off all the trees and shrubs in those hills. Then came a heavy rain. With no plants on the hillside to help hold the water, there was a great flood and a landslide which destroyed the cabin and washed out the canyon. (a) If the family paid \$40 a month, how many months did it take to pay for the new cabin they built for \$5,040 on leased land in a well-protected canyon in the Angeles National Forest? (b) Years?

*Solution: (a) 126 months.
(b) $10\frac{1}{2}$ years.*



Forest fires cause more damage than just the loss of timber or forage. In hilly or mountain country floods often follow fires.

Problem No. 10

The Wallowa Creek forest fire was discovered at 1:32 p. m., and was put out the next day at 11:10 a. m. How long was it after the fire was first seen before it was put out?

Solution: 21 hours and 38 minutes.



In dry, windy weather it may take days to put out a forest fire which somebody started by throwing away a lighted cigarette, or by forgetting to put out his campfire.



Problem No. 11

June, a forest ranger's daughter, was studying the cost of driving a pick-up truck. Her teacher asked her how much it cost her father and two fire wardens, each from a different place, to drive their pick-ups to a forest fire and back. June found that it costs $7\frac{1}{2}$ cents per mile to operate a pick-up. Her father had to go 14 miles to the fire, one warden had to go 6 miles, and the other warden 12 miles. How much did it cost for the three men to get to the fire and back to their stations?

Solution: \$4.80.

It costs lots of money to put out forest fires. Most of that money would be saved if people would be careful and prevent forest fires.

Problem No. 12

Out West forest fires sometimes get out of the timber and burn the grass and sagebrush on range or grazing lands. Jacqueline was given this problem: "A forest fire burned 3,000 acres. One-fourth of it was sagebrush, one-third was pine, and the rest was range grass. (a) How many acres of each kind burned? (b) What fraction was range grass?"

*Solution: (a) 750 acres sagebrush; 1,000 acres pine timber; 1,250 acres range grass.
(b) $\frac{5}{12}$ of total was range grass.*

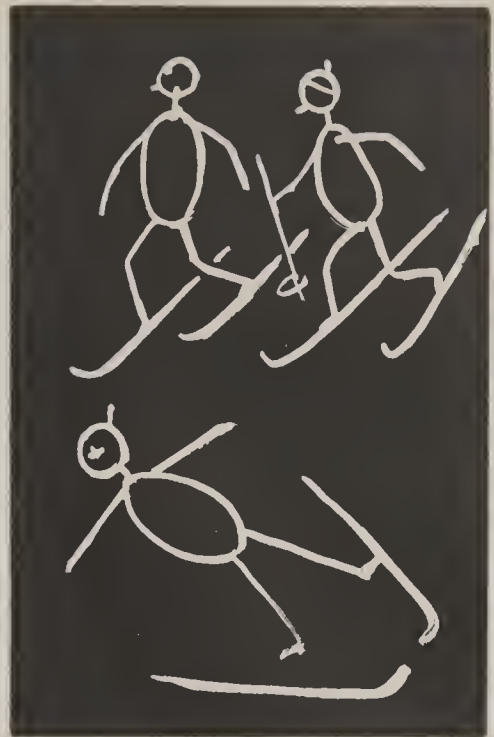


The cost of putting out just one forest fire may be enough money to reforest thousands of acres of land.

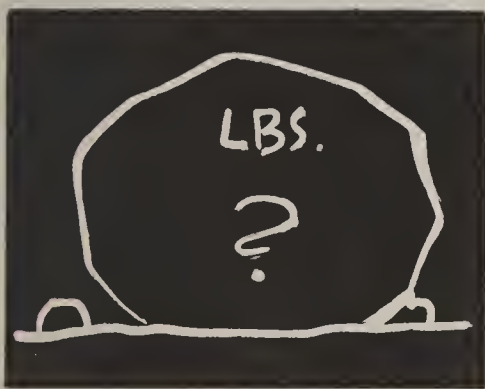
Problem No. 13

Skiing is a popular winter sport on many State and national forests. On the Arapaho National Forest in Colorado, a ski patrol helps injured skiers. One winter a skier was hurt on Seven Mile Ski Trail (so called because it is 7 miles long). The patrol found him 3 miles down the trail. Two members of the patrol put him on a toboggan and took him carefully down the trail to an ambulance. They had traveled at 6 miles per hour from the lodge (at the upper end of the trail) to the injured man. But they slowed down to 3 miles per hour from there to the road. (a) How long did it take them to reach the man? (b) How long did it take to travel on down to the ambulance after the injured man was placed on the toboggan?

*Solution: (a) $\frac{1}{2}$ hour.
(b) $1\frac{1}{3}$ hours.*



With thousands enjoying winter sports in the forests, a ranger must be prepared for all emergencies.



Problem No. 14

In Utah in 1930 a flood started from heavy rains on range land where cattle had eaten all the grass right down to the bare soil. The raging waters moved a huge boulder which weighed more than 200 tons. About how many pounds did the boulder weigh?

Solution: 400,000 pounds.

The destructive force of floods is enormous. A good grass cover on these lands would have prevented this flood.

Problem No. 15

Of the 18 national forests in California, 11 have winter-sports areas. One year 318,516 people enjoyed winter sports on those forests. What was the average number of people who went to each forest?

Solution: 28,956 winter-sports visitors to each forest.



On many State and national forests there are shelters, lodges, and first-aid stations for the use of people who enjoy winter sports.

Problem No. 16

The town in which Carole lives was built from the surrounding forests. Each acre contained about 400 large and small trees. Since only the "ripe" or "mature" trees were cut for lumber, each acre supplied about 100 trees. There were 1,000 homes in her town. (a) If it took 100 trees to build each house, how many trees did it take to build all the houses in town? (b) From how many acres did the timber come?

*Solution: (a) 100,000 trees.
(b) 1,000 acres of timber.*



For centuries civilized man has been born and buried in enclosures of wood.



Problem No. 17

Nick went out on a Saturday to help his father survey some forest land. They were measuring the land with a long, steel tape. The forest was a four-sided figure. They measured 1.163 miles on one side, 0.731 mile on another, 1.165 miles on the third, and 0.728 mile on the last. How many miles was it around the forest?

Solution: 3.787 miles.

In the United States, some counties, towns, villages, cities, schools, churches, and hospitals own community forests. Many of these were established to help protect watersheds which supply water for domestic use.

Problem No. 18

Forest soils are alive with tiny soil animals such as moss mites. Studies in the Appalachian Mountain country show that as many as 9,936 may be found in one square foot of forest litter. How many of these soil animals would there be per square inch?

Solution: 69 soil animals.

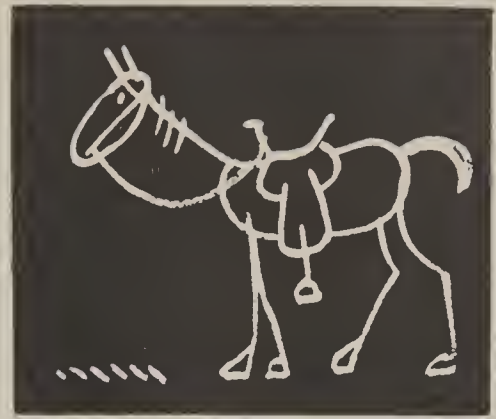


Earthworms help keep the soil porous so that it can take in more water.

Problem No. 19

Jim, a forest ranger, owns a horse and saddle. Together they cost \$140 when he bought them before the war. The saddle cost $\frac{3}{4}$ of the whole amount. How much did each cost?

*Solution: \$105, cost of saddle.
\$35, cost of horse.*



Most forest rangers are college graduates. The first forestry school in the United States was started in 1898 on the Biltmore Estate in North Carolina. Today there are about 30 forestry schools.



Problem No. 20

A farmer in Maine built a new fence. He cut 250 8-foot cedar fence posts from his own wood lot. The same fence posts, if bought at a local lumber yard, would have cost him 75 cents each. How much did he save in the cost of fence posts by cutting his own?

Solution: \$187.50.

The posts were cut in a crowded stand of young cedar trees. By cutting out the trees for posts, the remaining trees have more room and will grow faster.

Problem No. 21

Near Carole's home a forest fire burned off the trees. The forest ranger hired men to plant young trees on the burned land. One man, working 8 hours a day, plants 65 trees per hour. (a) How many trees can one man plant in a day? (b) If the forest fire burned over 468 acres and 1,000 trees were planted on each acre, how many trees were planted? (c) How many man-days would it take to plant the entire area? (One man-day is equal to the number of trees 1 man can plant in 8 hours.)

*Solution: (a) 520 trees per man per day.
(b) 468,000 trees.
(c) 900 man-days.*



We have 75,000,000 acres of idle forest land. Much of this needs to be planted if we are to make it grow good trees again.

Problem No. 22

On Mount Hood National Forest in Oregon, snow-plow guide stakes are 20 feet high to help guide snow plows which clear the roads in winter. (a) If $\frac{1}{4}$ of a stake can be seen above the snow, how deep is the snow? (b) If 0.75 of the stake is covered with snow, how much can be seen above the snow?

Solution: (a) 15 feet deep.
(b) 5 feet above snow.



Forest rangers are busy all year 'round. They care for the public forests so that they will be of "the most good for the most people."

Special thanks are given to those sons and daughters of Forest Rangers listed here who suggested problems upon which those in this pamphlet are based.

Name and Address	School
Lewis Anderson, Lead, S. Dak.....	Lead Junior High School.
Ralph C. Bryant, Ouray, Colo.....	Ouray Grade School.
Doug M. Eger, Buena Vista, Va.....	Virginia Polytechnic Institute.
Diane Hall, Wallowa, Oreg.....	Wallowa Public School.
Flora Gale Hall, Boise, Idaho.....	Garfield School.
Velda June Hall, Boise, Idaho.....	Garfield School.
Patsy Hanell, McKenzie Bridge, Oreg.....	McKenzie School.
Jerry Don Hodges, Estes Park, Colo.....	Estes Park Grade School.
Jacquelyn Jolley, Okanogan, Wash.....	Granger School.
Joanne Jolley, Okanogan, Wash.....	Granger School.
Carole Ann Lee, Idaho Springs, Colo.....	Idaho Springs Public School.
Rodney Lewis, Denver, Colo.....	Lake Junior High School.
Thomas Lewis, Denver, Colo.....	Lake Junior High School.
John M. Loring, Jr., Monte Vista, Colo.....	Central Junior High School.
Merrill L. Minges, Arvada, Colo.....	Arvada Grade School.
Nona Ellen Minges, Arvada, Colo.....	Arvada High School.
Kent G. Olson, Sunflower, Ariz.....	Irving School.
Albert H. Payson, Lander, Wyo.....	Lander Grade School.
Howard J. Payson, Lander, Wyo.....	Lander Vocational High School.
Betty Ratliff, Del Norte, Colo.....	Del Norte School.
Bonnie Rector, Alturas, Calif.....	Alturas Grade School.
Marilyn F. Smith, Fairplay, Colo.....	Fairplay Public School.
Dixie Sutton, Alamogordo, N. Mex.....	Alamogordo High School.
Michael Sweeley, Senora, Calif.....	San Jose State College.

Materials To Help Teach Forest Conservation

- 0-32** SUGGESTIONS FOR INTEGRATING FORESTRY IN THE MODERN CURRICULUM. 4 pages. A columnar chart showing how forestry can be integrated into the several subjects at the elementary, junior high school, and senior high school levels.

BULLETINS

- MP-162** Our Forests, What They Are and What They Mean To Us. 5 cents. 38 pages. Tells what the forest really is, describes the forest regions, shows how our forests serve us, lists the enemies of the forests, gives a brief history of forestry in the United States, and proposes a sound program for achieving true forest conservation.
- MP-290** The Work of the U. S. Forest Service. 10 cents. 32 pages. Emphasizes the responsibilities of the Forest Service and its far-flung activities in administering the 180,000,000 acres of national forests. It describes Forest Service cooperation with the States, forest-land owners, ranchers, forest industries, and farmers, to insure a perpetual supply of timber and other vital products from our forests and range lands.
- MP-388** Living and Forest Lands. 10 cents. 47 pages. A guide for study groups especially interested in the social and economic aspects of forests and forestry. Contains suggested classroom activities, questions for discussion, problems, evaluation tests.
- G-64** You and Forest Fires. 16 pages. Shows that 90 percent of our forest fires are caused by man's carelessness and thoughtlessness. Tells how they can be prevented.
- AIS-67** Know Your Watersheds. 13 pages. Facts about water. It tells what we must guard against and what we can do to assure safer and dependable water supplies.

POSTERS (Colored)

- W-3** How a Tree Grows (16 by 21 inches).
- W-7** Smokey Bear—Forest Fire Prevention (18 by 26 inches). Animal motif appeals to children and adults alike.

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United States Forest Service, Washington 25, D. C.

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1. Hold your match 'til it's cold—
then pinch it to make sure.
2. Crush out your cigarette, cigar,
pipe ashes. Use an ash tray!
3. Drown your campfire, then
stir and drown again.
4. Ask about the law before
burning grass, brush, fence
rows, or trash.



Remember - Only you can
PREVENT FOREST FIRES!